SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss on the classification of various Functions.

17. Explain the various rules of Inference for prepositional logic with suitable examples.

18. Solve the following recurrence relations with a step-by-step method.

(a) $a_n - 10a_{n-1} + 9a_{n-2} = 0, a_0 = 1, a_1 = 11$

(b) $a_n - 3a_{n-1} - 4a_{n-2} = 0, a_0 = 1, a_0 = 3$

(c) $a_n - 8a_{n-1} + 16a_{n-2} = 0, n \geq 2, a_2 = 16, a_3 = 90$

(d) $a_n - 4a_{n-1} + 4a_{n-2} = 0, a_0 = 3, a_1 = 8$

(e) $a_n - 20a_{n-1} + 100a_{n-2} = 0, a_0 = 2, a_1 = 30$.

19. Describe the Characteristic roots and Vectors in matrix.

20. Explain the following with examples :

(a) Incidence Matrix

(b) Adjacency Matrix.

NOVEMBER/DECEMBER 2024

23PCA11 — DISCRETE MATHEMATICS

Time : Three hours Maximum : 75 marks

SHANMUGA INDUSTRIES ARTS & SCIENCE COLLEGE LIBRARY

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are the various properties of Binary relations in a Set?

2. Define term Range of a Function.

3. List out the various Connectives used in a Logic.

4. What is a Universal quantifier?

5. Solve : $a_n = a_{n-1} + \frac{n(n+1)}{2}, a_0 = 0$.

6. How many distinct permutations of the letters of ASSESS are there?

7. List out the various types of Special matrices.

8. Define the Cayley-Hamilton theorem.

9. What is an Euler Graph?

10. Mention any four properties of the Incidence matrix in a Graph.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Let R and S be the relations on {1, 2, 3, 4} given by

R = {(1, 1), (1, 2), (2, 3), (3, 1), (3, 3), (3, 4), (4,3)}

S = {(1, 2), (1, 3), (2, 1), (3, 3), (4, 4)}

Find $R \cup S$, $R \cap S$, $\sim R$ and $R - S$.

Or

(b) Explain the representation of a Relation by Graph.

12. (a) Write a short note on Logic.

Or

(b) Obtain principal DNF and principal CNF of the following :

(i) $P \vee [P \vee (Q \vee (\neg Q \rightarrow R))]$

(ii) $(P \wedge Q) \vee (\neg P \wedge Q \wedge R)$

(iii) $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$

(iv) $P \rightarrow ((P \rightarrow Q) \rightarrow \neg(\neg Q \vee \neg P))$

(v) $(P \wedge Q) \vee (\neg P \wedge R)$.

13. (a) Find a recurrence relation for the sequence $\{a_n\}$ given by $a_n = A.2^n + B.(-3)^n$.

Or

(b) How many three-digit numbers with three distinct digits can be chosen from 1,3,5,7,9 and how many of these numbers are less than 700? Explain.

14. (a) Describe about the Determinant of a Matrix with an example.

Or

(b) Illustrate the Cayley – Hamilton theorem with suitable examples.

15. (a) Discuss on Connected graph with examples.

Or

(b) Explain the Bipartite graph with examples.